Trends in intraspecific sex-limited variations in some mycophagous Tubulifera (Thysanoptera)

BY

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(*With six text-figures and three graphs*)

The saprophytic fungus habitat forms an important ecological niche inhabited by a proportionately large number of thrips species, more predominantly the Tubulifera, which appear to have established themselves quite successfully in this zone. Seldom are they found alone, but are mostly gregarious, providing an unique opportunity to study species associations, in particular their dynamics, often revealing an unbelievably large degree of intraspecific diversity. In order to be able to recognise and interpret these variations which are more often confined to only the male sex, consistent field work coupled with years of experience are vital, in particular to avoid the risk of adding to our already long list of synonyms. Variations are magnified to a very large extent by the high incidence of heterogony or allomorphosis or absolute size allometry of adults, making the morphological definition of the species very difficult. A finely intergraded series is more often noticeable in populations of such species and the two extremes are often referred to as the minor or gynaecoid males and the major or oedymerous males. Oedymerism as defined earlier (Ananthakrishnan 1966) involves the development of bizarre forms with strikingly enlarged parts affecting mostly the structure and armature of the forelegs and incident changes in thoracic structure, while gynæcoidism results in opposite traits, with weakly developed forelegs having armature highly reduced and wanting and resembling the females in general make up. This does not result in reproductive incompatability as it has been observed in the rearing of *Tiarothrips subramanii* (Ramakrishna) and *Kleothrips gigans* Schmutz in the laboratory, that the gynæcoid males were freely engaged in copulation as much as the normal and œdymerous males.

The possibility that an odd gynaecoid or an œdymerous male on which a species is based, might only be one of the morphs of the highly variant males cannot be ignored. Many Oriental and African species of the genus *Elaphrothrips* Buffa have been described on such uniques. The most striking heterogonic character in this genus is the nature of the

foreleg armature, in particular the sickle-like bristle, absent in the gynæcoid males. In some species as *Elaphrothrips mucronatus* Priesner and *E. productus* Priesner further heterogony is shown in the degree of development of the 7th and 8th abdominal segments which may be as long as wide in the gynæcoid males and to more than twice as long in the œdymerous males. Again, examination of large series of *Dinothrips sumatrensis* Bagnall has confirmed Priesner's earlier suggestion (1959) that *D. jacobsoni* Karny, *D. celebensis* Bagnall and *D. sumatrensis* Bagnall are only the gynæcoid, intermediate and œdymerous forms of one species

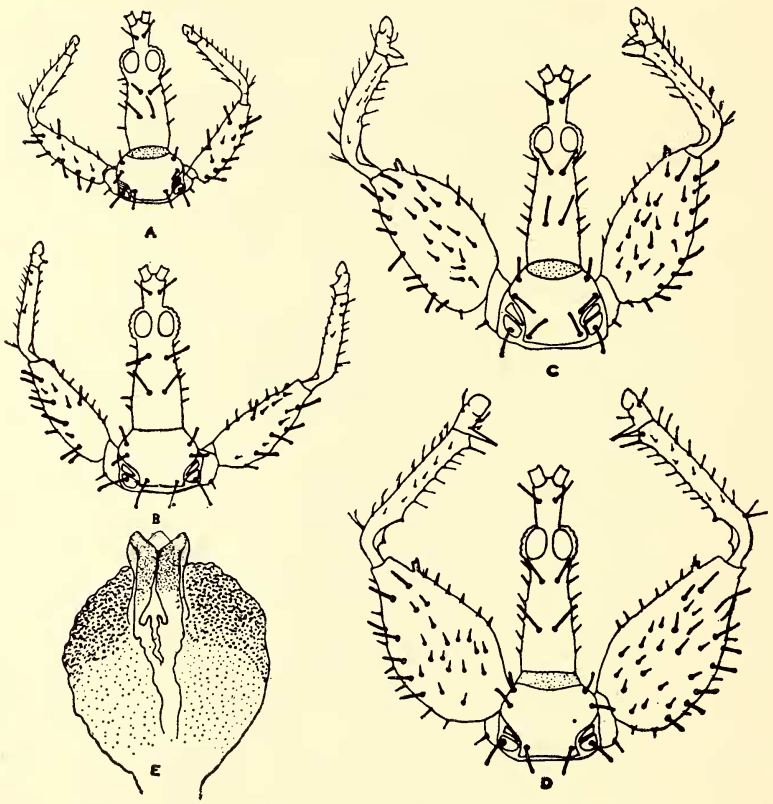
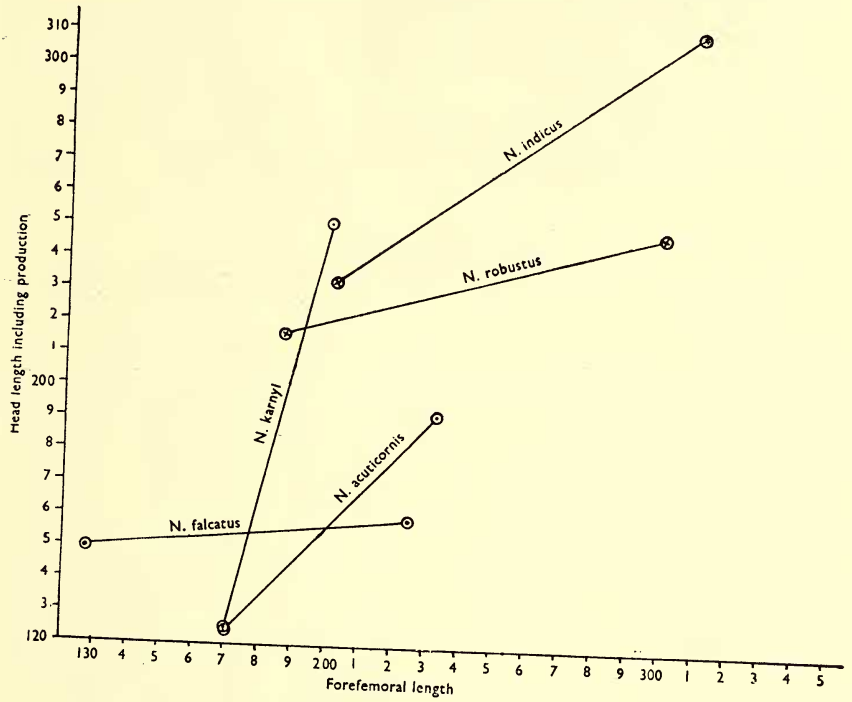


FIG. 1. The gynæcoid, œdymerous and intermediate forms of *Kleothrips gigans*. *A*. Gynæcoid male, *B*. Normal male, *C*. agama phase, *D*. Oedymerous male, *E*. Male genitalia.

D. sumatrensis (Fig. 2). Similarly Ananthakrishnan (1961) working with large populations of *Ecacanthothrips sanguineus* Bagnall concluded that several species mostly based on uniques or a few isolated specimens are all synonymous with *E. sanguineus*. Characters adopted in the erection of such species based on body colour, proportions of the head, the structure of the forefemora and tibia, the coxal prolongations in the

males, the number and position of the foretibial tubercles and even the number of sense cones on antennal segment 3, as well as the number of accessory setae on the forewings, were found to be very inconsistent in view of the enormous range of variation exhibited by individuals of a population. Again Ananthakrishnan (1969) on the basis of examination of large populations of *Kleothrips gigans* Schmutz, has indicated that *K. simplex* (Bagnall) may be the gynæcoid form, while *K. agama* Priesner hitherto considered to be distinct is only a phase in œdymerism of the species (Fig. 1 & Graph 1). This is also the case observed in *Elaph-*



GRAPH 1. Relation between forefemoral length and head length in the males of some species of *Nesothrips*.

rothrips mucronatus, *E. productus*, etc. where also two distinct phases exist in œdymerism, viz. one with foretarsal tooth thin and straight and the other where it is more stout and beak-like. The fact that the males of a species show maximum œdymerism need not imply the development of a strong armature as in *Pygothrips* Hood, some species of *Nesothrips* Kirkaldy as *N. indicus* Ananthakrishnan, & *N. robustus* Ananthakrishnan. On the contrary the œdymerous males of several species like *Nesothrips falcatus* Ananthakrishnan, *N. acuticornis* (Hood), *Ecacanthothrips sanguineus*, *Hoplothrips fungosus* Moulton, *H. transvaalensis*, etc., reveal a wide variety of structures like coxal spines, forefemoral teeth and spines, foretibial teeth, excessively developed foretarsal teeth, lateral or median

meso- or metanotal processes and tooth-like prolongations on cheeks below eyes totally unknown in the gynæcoid forms, leaving therefore an enormous gap between the two extremes (Fig. 3). Naturally the patterns of development differ in the males of different species or species groups. Two closely allied species may possess almost similar characteristics among the females, but the pattern of œdymerism will vary as in *Nesothrips falcatus* and *N. acuticornis*, *N. indicus*, *N. robustus* and *N. formosensis karnyi* Priesner. Ananthakrishnan (1968) indicates that in the assessment of allomorphosis three indices may appear significant for species comparison in relation to growth diversity, viz. HL/FL, HW/FW, TL/FL and only in cases lacking of specialisation of the forelegs there are very close similarities between the two sexes, whereas in those mycophagous species showing sex limited diversity, not only are the allomorphic indices substantially different in the two sexes, but also very much different among the two extreme variants (Table 1). Inciden-

TABLE 1

ALLOMORPHIC INDICES

Species	HL/FL		HW/FW		TL/FL	
	G	O	G	O	G	O
Azaleothrips amabilis ..	1·2	1·2	2·4	2·4	0·66	0·7
Hoplandrothrips indicus ..	1·0	0·63	2·5	2·44	0·9	0·73
Hoplandrothrips graminis ..	1·3	1·0	2·5	1·4	0·8	0·6
Ecacanthothrips sanguineus ..	1·2	0·8	1·9	0·6	0·8	0·65
Hoplothrips fungosus ..	0·9	0·45	1·4	1·0	0·6	0·4
Hoplothrips transvaalensis ..	1·1	0·6	2·4	1·4	0·66	0·4
Hoplothrips orientalis ..	1·2	0·7	2·0	1·0	0·8	0·45
Sophiothrips parviceps ..	1·25	0·85	2·3	1·5	0·6	0·45
Strepterothrips orientalis ..	1·8	1·0	3·0	1·6	0·8	0·5
Idiothrips ficus ..	1·2	0·66	2·2	1·9	0·6	0·6
Stictothrips orientalis ..	1·4	1·5	2·0	2·2	0·8	0·6
Neurothrips indicus ..	0·6	0·75	2·2	1·7	0·5	0·38
Polyphemothrips cracens ..	1·1	0·8	1·0	1·25	0·65	0·45
Allothripsb icolor ..	1·7	1·1	3·0	1·4	0·85	0·6
Nesothrips falcatus ..	1·0	0·73	2·5	1·9	1·5	0·53
Nesothrips acuticornis ..	1·0	0·66	2·5	1·4	0·63	0·5
Nesothrips indicus ..	1·1	1·15	2·5	2·1	0·79	0·8
Nesothrips robustus ..	1·25	0·82	2·6	1·4	0·8	0·52
Nesothrips formosensis karnyi ..	1·0	0·62	2·3	1·6	0·75	0·65
Kleothrips gigans ..	1·5	1·0	1·45	0·45	0·9	0·8
Tiarothrips subramanii ..	2·0	1·9	1·8	1·0	0·8	0·66
Priesneriana kabandha ..	1·1	1·0	2·2	1·7	0·75	0·6
Dinothrips sumatrensis ..	0·95	0·9	1·3	0·92	0·9	0·82
Pygothrips amplus ..	0·6	0·7	1·7	1·25	0·4	0·5
Elaphrothrips dallatorensis ..	1·4	1·23	2·5	1·15	1·2	0·73
Elaphrothrips mucronatus ..	1·3	1·2	1·66	0·9	1·9	1·0
Elaphrothrips productus ..	1·5	1·25	1·75	0·65	0·8	0·6

Note : HL/FL—Head length/Forefemoral length ; HW/FW Head width/Forefemoral width ; TL/FL—Foretibial length/Forefemoral length ; G—Gynæcoid ; O—Oedymerous.

The index refers to the ' Maximum ' *viz.* between the Gynæcoid and Maximum Oedymerous forms so far known.

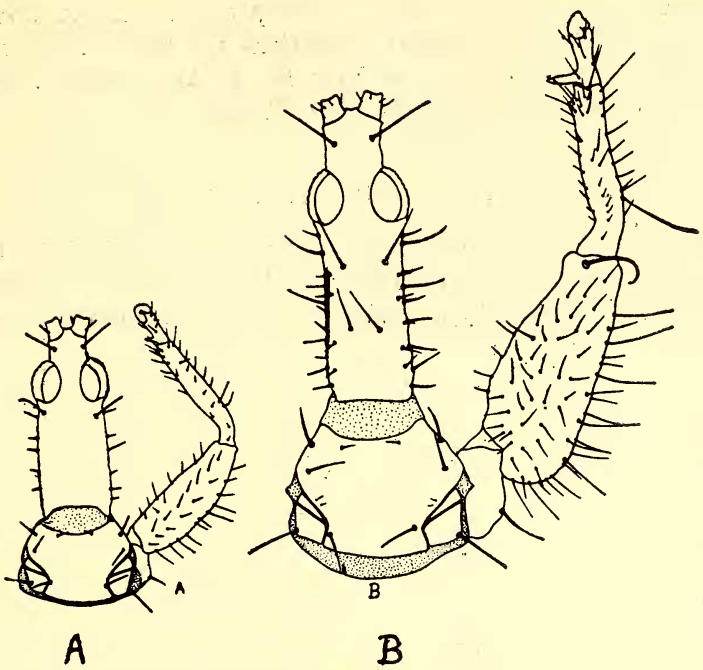
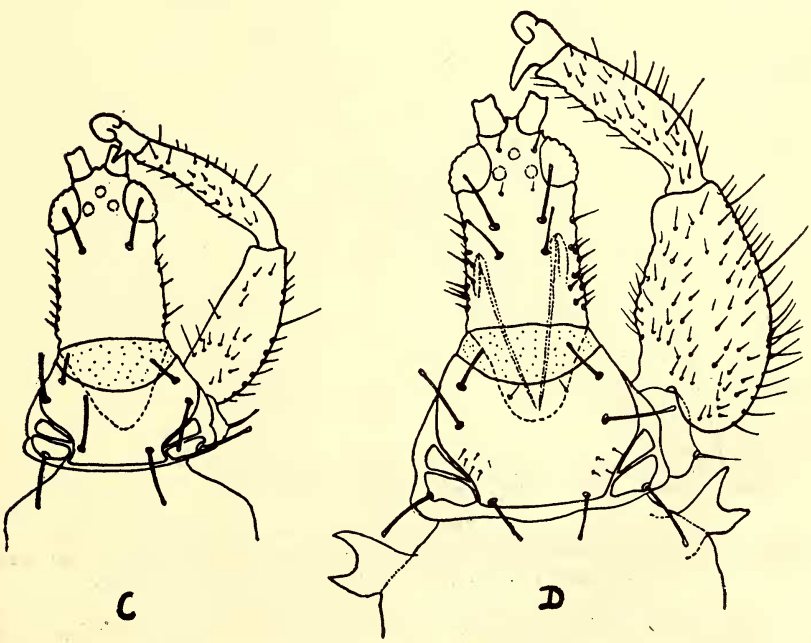


FIG. 2. *A*, *B* Gynæcoid and œdymerous male of *Elaphrothrips mucronatus*.

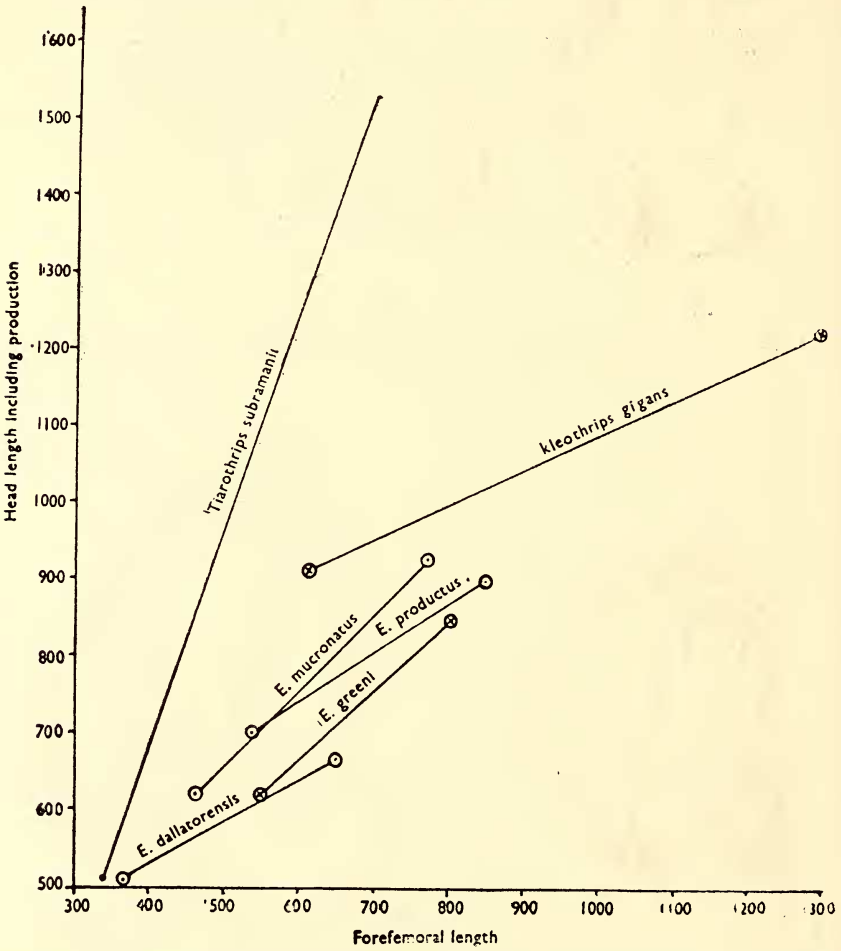


C, *D*. Gynæcoid and œdymerous male of *Dinothrips sumatrensis*.

tally mention may also be made of mycophagous Tubulifera wherein such recognisable and significant variations are absent as in several Urothripids, species of *Adraneothrips* Hood, *Stigmothrips* Ananthakrishnan, *Malacothrips* Hinds, *Meiothrips* Priesner etc.

Thrips fauna of the Saprophytic fungal zone

Among the Phlaeothripini some species of *Hoplandrothrips* Hood, *Azaleothrips* Ananthakrishnan, *Phlaeothrips* Haliday, *Malacothrips* Hinds, *Ecacanthothrips* Bagnall, *Pygmaeothrips* Karny, etc. frequently occur, but



Graph 2. Relation between the forefemoral length and the head length in the males of *Tiarothrips*, *Kleothrips* and some species of *Elaphrothrips*.

species of *Phlaeothrips* Haliday, *Malacothrips* Hinds, *Mystrothrips* Priesner, *Adraneothrips* Hood, *Stigmothrips* Ananthakrishnan and *Pygmaeo-*

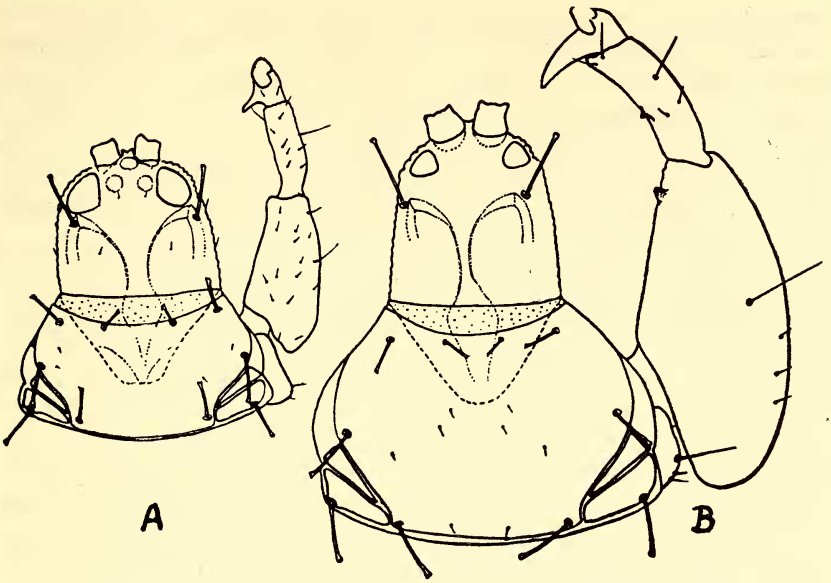
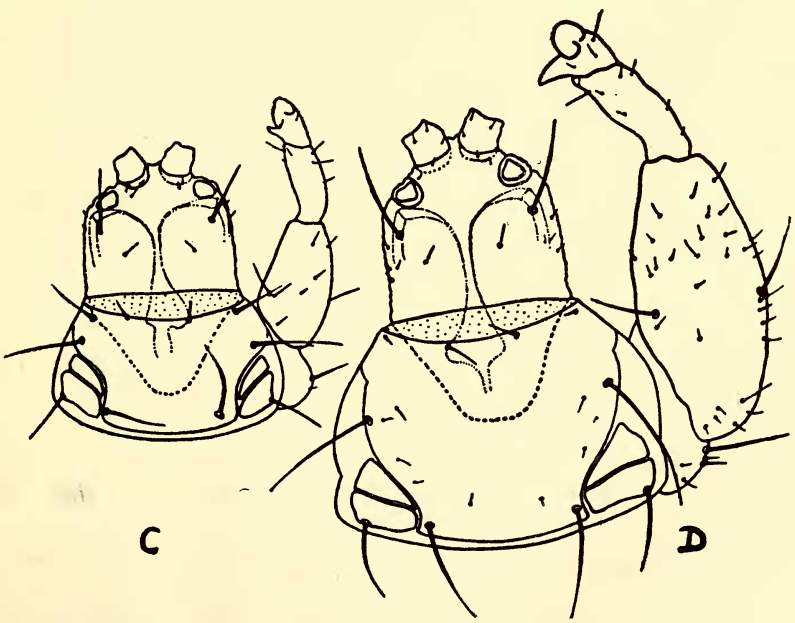


FIG. 3 *A*, *B*. Gynæcoid and œdymerous male of *Hoplothrips fungosus*.



C, *D*. Gynæcoid and œdymerous male of *Hoplothrips transvaalensis*.

thrips Karny do not present remarkable sex-limited diversities as the foretarsi are usually unarmed in both sexes, *Hoplandrothrips* Hood, *Ecacanthothrips* Bagnall and to a limited extent *Strepterothrips* Hood, *Neurothrips* Hood and *Idiothrips* Faure exhibit profound variation. The Plectrothripini appears exceptional in having females of the major and minor types, differing very significantly. The Hoplothripini also include such genera as *Hoplothrips* Serville, *Sophiothrips* Hood, frequently abounding in the fungal niches, with extreme specialisation shown by the males of many species of *Hoplothrips* Serville. The best examples of such structural diversity are met with among the Megathripinae including in it a welter of species, showing variants of many types. Species of *Elaphrothrips* Buffa, *Dinothrips* Bagnall, *Paxillothrips* Ananthakrishnan, *Tiarothrips* Priesner, *Kleothrips* Schmutz, *Nesothrips* frequently reveal such remarkable diversities, while others like *Allothrips* Hood, *Loyolaia* Ananthakrishnan, *Priesneriana* Ananthakrishnan, *Diceratothrip* Bagnall, *Diaphorothrips* Karny and *Uredothrips* Ananthakrishnan show this feature to a restricted degree. Among the Diceratothripina the genus *Machatothrips* Karny shows more diversity in the females in view of this sex possessing the heavily armed forefemora. *Bunothrips cruralis* Ananthakrishnan, a Hoplothripine species also shows more diversity in the females. It may be emphasised that all the species in a genus say like *Nesothrips* need not necessarily develop identical patterns of diversity, requiring therefore absolute caution before concluding on the identity of the species.

Coming to the nature of species associations in this zone, field studies show that monophagous species among saprophytic fungus feeders are rare and *Tiarothrips subramanii* feeding in large numbers on the dried fungus infested leaves of *Borassus flabellifer* is a typical example. *Kleothrips gigans* Schmutz may be said to be oligophagous in the restricted sense as it abounds invariably in the decaying sheaths and leaves of *Areca catechu* in the company of swarms of *Stigmothrips limpidus* Ananthakrishnan and *Meiothrips menoni* Ananthakrishnan as well as in the dried leaves of *Mangifera indica* especially in forest areas, being found along with *Meiothrips menoni* and *Stigmothrips consimilis* Ananthakrishnan. Frequently associated with the polyporous fungi (*Poria* sp.) usually on the dry fungus infested twigs of *Barleria* sp. are *Polyphemothrips cracens* Ananthakrishnan, *P. indicus* (Ananthakrishnan) and *Hoplothrips fungosus* Moulton, while similarly infested jasmine twigs yield considerable material of *Sophiothrips parviceps* Hood and *Hoplothrips fungosus*. *Polyalthia longifolia* twigs have yielded *Uredothrips indicus* Ananthakrishnan, *Pygothrips amplus* Faure, *Priesneriana kabandha* (Ramakrishna) and *Hoplothrips transvaalensis* (Hood); twigs of *Lantana* harbour plenty of *Nesothrips formosensis karnyi* Priesner and Urothripids while the dry twigs of *Smilax* offer plenty of material of *Nesothrips falcatus*

Ananthakrishnan, *Elaphrothrips crassiceps* Bagnall, *Stephanothrips occidentalis* Hood & Williams, *Diceratothrips brevisetosus* Ananthakrishnan & Jagadish, etc.

KEY TO MALES OF MYCOPHAGOUS TUBULIFERA BASED ON GYNÆCOID-ŒDYMEROUS TRAITS

1.	Maxillary stylets slender, thinner than labial palps, rarely moderately thickened as in *Polyphemothrips*; B2 of abdominal segment IX short (Phlaeothripinae)	2
	Maxillary stylets broad, band-like thicker than labial palps; B2 of IX abdominal segment mostly subequal with the rest (Megathripinae)	12
2.	Forewings Stictothripine, œdymerous males without profound modification. Body strongly reticulate	3
	Wings not Stictothripine, usually parallel-sided. Oedymerous males often showing profound diversity	6
3.	Antenna 7-segmented	4
	Antenna 8-segmented	5
4.	Head elongate; œdymerous males with forefemora much elongate and stout, foretibia at apex with a strong tooth, foretarsal tooth strong and curved and mesonotum with distinct lateral spines. Antenna 7-segmented, segment 3, short, flat.	*Strepterothrips* Hood (*S. orientalis* Ananthakrishnan)
	Head about as long as wide; œdymerous males with simple forelegs and tibial tooth and mesothoracic spur absent. Antennal 7 much smaller than 6; 3 and 5 whitish.	*Idiothrips* Faure (*I. fici* Bhatti)
5.	Abdominal segment X long and cylindrical, anal setae several times longer than tube. Forefemora of œdymerous males, long and stout i.e. heavy, foretarsal tooth strongly developed. Wings not reticulate	*Neurothrips* Hood (*N. indicus* Anan.)
	Tube and anal setae normal; forelegs of œdymerous males not long and heavy as in *Neurothrips*, almost showing slight enlargement of forefemur. Wings clearly reticulate.	*Stictothrips* Hood *S. fimbriata* (Anan.)
6.	Wings comparatively narrow, with a feeble constriction at middle	7
	Wings not narrow, uniformly parallel-sided	9

7.	Cheeks smooth, head reticulate, body setae short, expanded. Oedymerous males with forefemora heavy as in *Neurothrips* and foretarsal tooth strong.	*Azaleothrips* Anan. (*A. amabilis* Anan.)
	Cheeks with strong spines often on warts ; weakly reticulate. Oedymerous males with strongly developed pronotum and forelegs strongly armed	8
8.	Sense cones on antennal segment 3 arranged in a ring. Forefemora of œdymerous males very much wider than head, with a strong tooth at base and apex ; outer margin concave, with numerous long hairs. Forecoxae considerably prolonged in the œdymerous.	*Ecacanthothrips* Bagnall (*E. sanguineus* Bagnall)
	Sense cones on 3 normal. Forefemora in œdymerous males with 2 or more subapical teeth, foretibia with a tooth at base of inner margin and one at apex. Foretarsal tooth strong.	*Hoplandrothrips* Hood [*H. indicus* (Ramk. & Marg.) *H. graminis* Anan.]
9.	Head dorsally not convex, without cheek pouches, antenna 8-segmented	10
	Head dorsally convex, with cheek pouches, antenna 7-segmented	11
10.	Small forms, with œdymerous males having excessively enlarged pronotum, head more elongate and cheeks with concavity, forefemora very long, foretibia short and foretarsal tooth strong.	*Sophiothrips* Hood *S. parviceps* (Hood)
	Small and large forms showing several degrees of œdymerism. Pronotum heavy in œdymerous males with forefemora moderately to exceedingly long, foretibia short, foretarsal tooth strong ; forefemora at apex rarely and foretibia with one or more teeth at middle or apex ; sometimes cheeks prolonged sidewards tooth-like ; evidence of negative allometry in some species, relating to anteroangulars.	*Hoplothrips* Serville *H. fungosus* Moulton *H. transvaalensis* Hood *H. orientalis* (Anan.)
11.	Maxillary stylets moderately thick, œdymerous males with forefemora carrying a posterior prolongation and with 2 large humps one at base and apex of inner margin. Foretibia with a strong tubercle at apex.	*Polyphemothrips* Schmutz (*P. cracens* Anan.)

12.	Antenna 7-segmented	13
	Antenna 8-segmented	14
13.	Males invariably, apterous; antennal 3 without sub-basal ring. Oedymerous males with moderately enlarged forelegs. Maxillary stylets not 'V' like.	*Allothrips* Hood (*A. bicolor* Anan.)
	Antennal 3 with a distinct subbasal ring; maxillary stylets V like. Forelegs in œdymerous males, heavier.	*Percnothrips* Anan. (*P. turbinatus* Anan.)
14.	Head not or very little produced	15
	Head distinctly produced	19
15.	Head slightly produced, cheeks incut behind eyes; œdymerous males with heavy, elongate forefemora. Tube heavy.	*Loyolaia* Anan. (*L. indica* Anan.)
	Cheeks normal. Head not produced	16
16.	Head dorsally convex. Antennal 3 with a distinct sub-basal ring. Forefemora of œdymerous males, concave along inner margin.	*Priesneriana* Anan. [*P. kabandha* (Ramk. & Marg.)]
	Head normal, segment 3 of antenna without sub-basal ring. Forefemora of œdymerous males not concave at inner margin.	17
17.	Maxillary stylets distinctly 'V' like, œdymerous males with diverse patterns; with the development of coxal and femoral strong chitinous spines, foretibial teeth and excessively long foretarsal tooth and metanotal process (*N. falcatus*) or less specialised but with lateral mesothoracic spurs, and metanotum at base with numerous teeth (*N. acuticornis*) or more simple, only with heavy forefemora, often concave at inner margin in œdymerous males (*N. indicus*, *N. robustus* and *N. formosensis karnyi*)	*Nesothrips* Kirkaldy
	Maxillary stylets not 'V' like and œdymerous males more simple[1].	18
18.	Foretibia at apex with a strongly developed tooth in normal and œdymerous males and reduced to a hardly recognised tubercle in gynæcoid males. Tube longer than head.	*Diaphorothrips* Karny (*D. unguipes* Karny)

[1] The genus *Machatothrips* Karny has forefemora with a series of 4-5 dark chitinous teeth, absent in the males.

Tube shorter than head, more parallel-sided, not heavy ; setæ on abdominal segment IX normal ; foretibia unarmed. Oedymerous males with heavy forefemora, postocellar setae distinct. *Diceratothrips* Bagnall

19. Mesothorax at sides with a fork or peg 20

Mesothorax without lateral processes 21

20. Mesothorax with a distinct fork, wanting in gynæcoid males. Oedymerous males with very strongly developed forefemora with strong spines ; foretibia with numerous denticles on inner margin and foretarsal tooth very strong. *Dinothrips* Bagnall (*D. sumatrensis* Bagnall)

Mesothorax with a strong peg in the œdymerous males, hardly recognisable in gynæcoid males. Otherwise œdymerous males as in Dinothrips *Paxillothrips* Anan. (*P. longicaudus* Anan.)

21. Head production in œdymerous males excessively developed, 4·5–5 times as long as in gynæcoid males and as long or a little longer than head. Antennal segment 3 very long, sides strongly and asymmetrically sinuate, with deep concavities and carrying strong setae at apex. Forefemora stout, strongly armed with spines and foretarsal tooth very long and strong ; gynæcoid males with short head production, often shorter than head ; 3rd antennal segment weak, sides not sinuate and without strong setae at apex. Forefemora weak as also the foretarsal tooth. *Tiarothrips* Priesner *T. subramanii* (Ramk.)

Head production in œdymerous males not excessively developed, much shorter than head 22

22. Head production not parallel-sided, broader in front ; antennal 3 with clubbed apex. Forefemora in œdymerous males excessively enlarged and with a forked chitinous tooth at apex of inner margin ; foretarsal tooth strongly developed ; forefemoral and foretarsal teeth absent in gynæcoid males. *Kleothrips* Schmutz [*K. gigans* (Schmutz)]

Head production usually parallel-sided, antennal segment 3 not clubbed at apex ; forefemora at apex in œdymerous males with a sickle-like bristle; genal bristles and those on forelegs very strongly

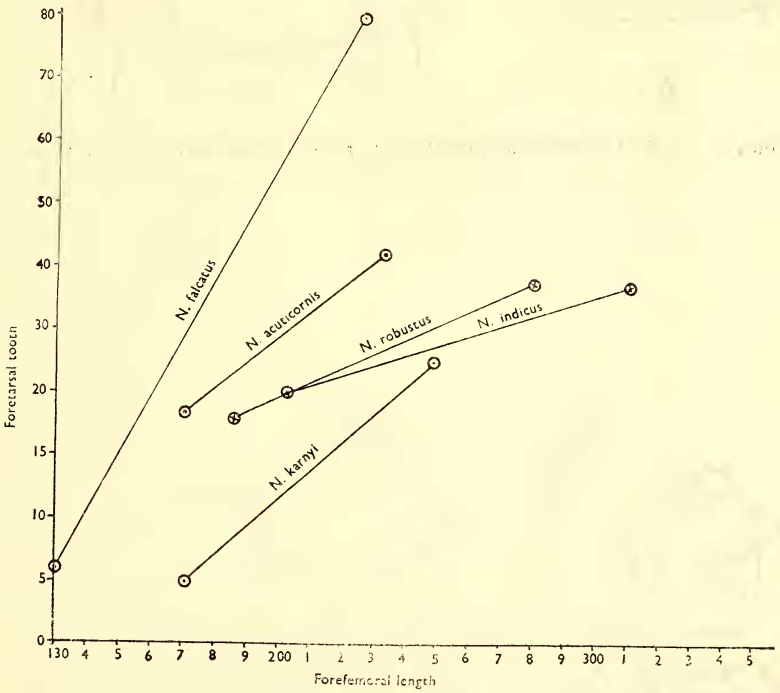
developed; gynæcoid males with weak forefemora, thin foretarsal tooth and without sickle-like bristle.

Elaphrothrips Buffa
(*E. dallatorrensis* Bagnall
E. mucronatus Priesner)
E. productus Priesner

[Since sending the note for publication, the megathripine genus *Bactridothrips* has been discovered, with the males bearing a pair of long processes on the VI abdominal segment and the VII & VIII segments with a tooth on either side.]

Patterns of diversity among males

The simplest type occurs in such species as *Nesothrips indicus*, *N. robustus*, *Priesneriana kabandha*, *Pygothrips amplus*, *Uredothrips indicus* etc. with minimal effects on the morphs where the œdymerous males



Graph 3. Relation between forefemoral length and foretarsal tooth in the males of some species of *Nesothrips*.

develop strong forelegs, with stout forefemora and a moderately stout foretarsal tooth, without developing any other structural complexities. This pattern has been referred to by Ananthakrishnan (1968) as simple, monophasic or unitary. When, however, such œdymerous traits as above are coupled with the development of additional features such as

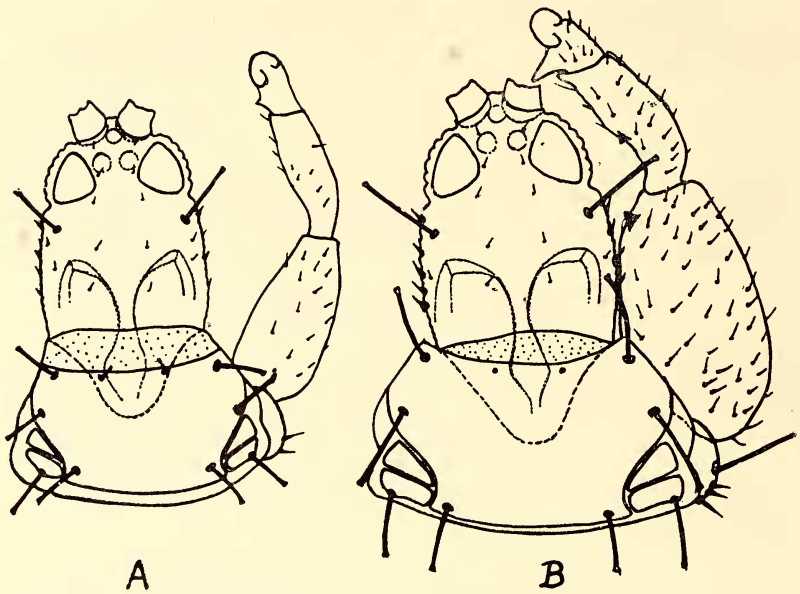
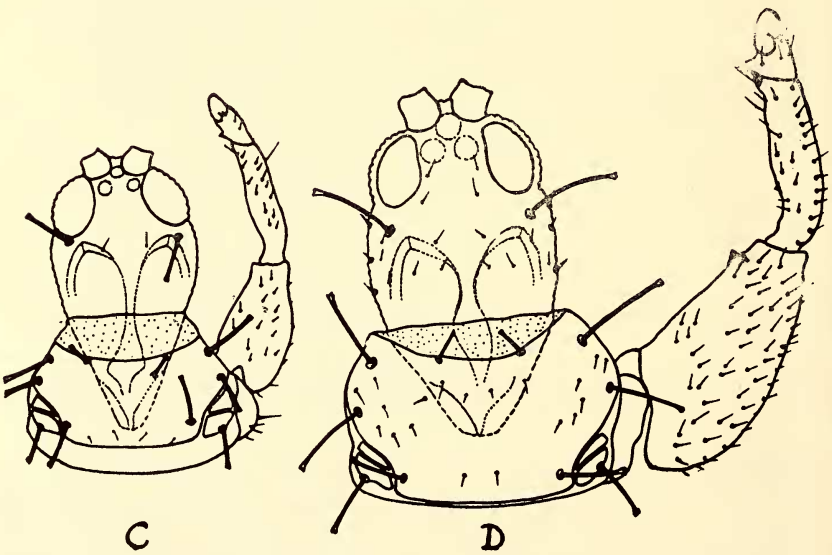


FIG. 4 *A*, *B*. Gynæcoid and œdymerous male of *Hoplandrothrips graminis*.



C, *D*. Gynæcoid and œdymerous male of *Hoplandrothrips indicus*.

forefemoral or tibial teeth, or horns on the head below eyes, or lateral or median meso- or metanotal processes, the pattern of œdymerism is referred to as *multiple* or *polyphasic*. Not all the known œdymerous forms of species develop this complete multiple pattern, enabling a further division of the multiple type into unidirectional and multidirectional categories. Multiple or polyphasic patterns therefore involve not only pronounced development of several parts and varying with species or species groups, it also results in the development of certain additional structures only in the extreme œdymerous individuals not known in the normal males. Typical examples of Indian species known to develop the multi-directional patterns—*Ecacanthothrips sanguineus*, *Hoplandrothrips graminis*, *H. indicus*, *Tiarothrips subramanii*, *Dinothrips sumatrensis*, *Paxillothrips longicaudus*, *Nesothrips acuticornis* and *Nesothrips falcatus*, the latter species showing the maximum degree of œdymerism and its effects in spite of its smaller size. In *Hoplandrothrips* as seen in *H. indicus* and *H. graminis* (Fig. 4), the œdymerous males develop very strong forefemora, with 2 or 3 subapical teeth, a basal or apical foretibial teeth, longer prothoracic bristles, in particular the anteroangulars as well as strong cheek setae. *Ecacanthothrips sanguineus* closely related to *Hoplandrothrips* shows a profound gap between the gynæcoid and œdymerous forms, the gynæcoids being exceedingly feeble in general make up, lacking a strong pronotum, cheek setae, strong femora and teeth, weak tarsal tooth and absence of coxal prolongation. Further they develop tibial tubercles beyond middle of foretibia, a feature lacking in normal and œdymerous males and present only in the females. In the œdymerous males the outer margin of the forefemora at base, tends to be clearly concave and is fringed with a cluster of fine hairs. This concavity becomes progressively reduced, along with the size and number of the fringing hairs as we proceed down the series to the gynæcoid. Striking variations between the various forms are also confined to the distribution of the red pigment, the number of sense cones, the size of antennal segments and in the number of double fringes. *Strepterothrips orientalis* and *Polyphemothrips cracens* also appear to show the multidirectional patterns to a limited extent (Fig. 5).

A further feature of importance is the degree of diversity in the macropterous, brachypterous and apterous males co-existing in a population and which to an untrained eye is liable to lead to misidentification of the species when recorded independently from different habitats. In species of *Hoplothrips* such as *H. fungosus*, *H. transvaalensis*, *H. orientalis* and others, the prothorax is smaller in the winged forms, their ocelli and eyes enlarged and the sense cones also much longer. The head may be variable in form in apterous males, with diversity in the degree of development of horn-like projections below eyes. They are wanting in the gynæcoid males where the head may be a little longer than

TABLE 2

INTRASPECIFIC DIVERSITY IN THE MALES OF SOME MYCOPHAGOUS TUBULIFERA

Characters	*Elaphrothrips productus*	*E. mucronatus*	*E. procer dallatorensis*	*E. greeni* (=*E. bouvierii*)	*Tiarothrips subramanii*	*Kleothrips gigans*	*Dinothrips sumatrensis*
Total body length (in mm.)	4·8–8·37	3·6–8·5	3·7–6·0	4·9–7·9	4·57–6·98	7·04–10·5	6·05–7·60
Total head length	496–775	481–775	450–589	558–713	330–720	592–960	543–651
Total production length	108–217	86–186	55–93	62–171	176–768	176–320	176–768
Width across eyes	202–295	241–326	210–264	248–326	233–279	240–336	341–434
Width across cheeks	171–233	217–264	202–217	233–248	233–264	176–240	310–388
Width at base	202–248	225–264	217–248	248–264	279–326	240–336	310–388
Eyes length (width)	93–154	93–155	93–124	108–140	108–124	171–202	140–155
	(63–78)	(70–93)	(62–78)	(70–78)	(78–93)	(93–124)	(108–140)
Postoculars	143–188	100–195	125–133	150–233	45–70	93–155	140–155
Production setae	150–188	73–200	100–138	150–186	Nil	108–202	—
Cheek setae	25–124	78–132	28–88	40–124	47–78	62–93	78–108
Antennal segments length (width)							
3	217–371	186–372	171–233	194–341	320–960	288–480	279–341
	(35–47)	(40–58)	(35–38)	(43–50)	(35–47)	(47–62)	(47–62)
4	202–318	186–326	140–202	171–310	158–268	256–416	202–248
	(31–35)	(38–47)	(38–40)	(43–50)	(31–47)	(55–62)	(55–62)
5	155–263	171–264	124–171	155–248	125–218	216–320	202–248
	(31–35)	(38–47)	(35–38)	(38–40)	(31–47)	(47–55)	(47–55)
6	108–155	108–171	93–116	101–155	99–140	155–217	155–186
	(23–25)	(28–31)	(28–30)	(28–31)	(31–39)	(31–35)	(47–49)
7	78–93	70–93	62–78	70–93	55–70	93–101	108–124
	(20–23)	(24–25)	(23–25)	(24–25)	(24–31)	(23–26)	(31–34)
8	62–78	62–78	55–62	62–86	78–82	78–93	78–93
	(15–16)	(16–18)	(15–16)	(15–18)	(16–18)	(16–19)	(15–18)
Longest seta on 3 (antennal segment)	68–155	63–223	48–75	88–202	34–260	60–70	78–108
,, on 4	75–140	63–194	53–63	50–163	62–140	60–70	78–108

Length of sense cones on 3	55–65	65–68	40–45	43–63	24–31	78–93	47–62
Length of mouth cone	171–233	208–248	171–217	171–264	186–264	233–264	248–295
Width at base (apex)	171–217	286–233	186–202	233–248	263–310	230–330	310–357
	(62–93)	(62–78)	(78–93)	(85–108)		(108–155)	(155–202)
Prothorax length	203–372	233–465	217–357	248–388	217–341	240–434	326–527
Width (anterior)	214–310	248–326	233–379	279–295	310–357	264–388	357–465
Width (posterior)	341–496	388–558	372–527	419–558	388–512	434–620	527–806
Anteroangulars	65–75	55–120	63–70	60–108	18–33	72–144	76–93
Midlaterals	80–85	78–130	75–90	100–113	47–78	78–108	141–124
Postangulars	63–75	100–113	88–103	88–125	47–78	93–108	186–233
Epimerals	113–135	113–188	80–120	125–163	100–113	88–176	202–233
Prothorax length	558–853	589–1007	496–775	651–961	217–341	240–434	791–930
Mesothorax, width	465–721	527–899	496–667	605–853	496–698	620–930	744–1100
Metathorax, width	465–713	504–899	481–713	605–853	496–698	620–930	729–1115
Forefemora length (width)	403–698	419–791	403–667	465–791	388–713	512–1280	481–806
	(108–326)	(124–310)	(124–310)	(124–310)	(140–279)	(144–224)	(171–419)
Foretarsal tooth length	25–124	33–108	25–70	55–116	70–155	–192	47–148
Forewings, length	1504–2279	1519–2557	1318–1442	1612–2434	1318–1860	2077–2945	2062–2634
Basal wing bristles	93–135	48–171	58–88	100–160	43–58	86–220	108–155
	85–124	83–132	63–75	88–125	43–70	86–242	155–202
	150–178	153–233	158–200	170–250	55–85	127–239	202–310
Double fringes	24–38	30–46	25–29	45–52	27–30	40–77	42–56
Abdomen width at base	434–574	450–682	481–651	574–698	512–677	496–698	651–960
at middle	327–481	341–434	388–527	403–589	357–574	403–620	574–868
across VII	210–295	217–327	233–310	295–310	264–326	264–388	526–403
across IX	171–233	171–279	170–233	148–264	186–233	202–326	248–310
Setae on IX B1	388–636	388–558	341–388	465–574	233–310	465–543	775–853
B2	496–690	419–605	310–341	419–589	233–341	465–543	775–853
B3	388–590	388–558	336–388	388–465	233–310	465–543	775–853
Tube, length	388–620	403–698	357–496	419–620	388–589	510–880	589–790
Width at base	93–108	93–155	93–124	140–155	93–124	140–171	155–202
at middle	78–108	78–108	62–108	93–108	70–93	108–140	108–155
at apex	47–78	62–78	47–70	78–82	55–62	78–93	78–93
Anal setae, length	124-540	295–512	248–310	311–512	233–310	465–543	465–512

TABLE 2

INTRASPECIFIC DIVERSITY IN THE MALES OF SOME MYCOPHAGOUS TUBULIFERA

Characters	*Elaphrothrips productus*	*E. mucronatus*	*E. procer dallatorensis*	*E. greeni* (=*E. bouvierii*)	*Tiarothrips subramanii*	*Kleothrips gigans*	*Dinothrips sumatrensis*
Total body length (in mm.)	4·8–8·37	3·6–8·5	3·7–6·0	4·9–7·9	4·57–6·98	7·04–10·5	6·05–7·60
Total head length	496–775	481–775	450–589	558–713	330–720	592–960	543–651
Total production length	108–217	86–186	55–93	62–171	176–768	176–320	176–768
Width across eyes	202–295	241–326	210–264	248–326	233–279	240–336	341–434
Width across cheeks	171–233	217–264	202–217	233–248	233–264	176–240	310–388
Width at base	202–248	225–264	217–248	248–264	279–326	240–336	310–388
Eyes length (width)	93–154	93–155	93–124	108–140	108–124	171–202	140–155
	(63–78)	(70–93)	(62–78)	(70–78)	(78–93)	(93–124)	(108–140)
Postoculars	143–188	100–195	125–133	150–233	45–70	93–155	140–155
Production setae	150–188	73–200	100–138	150–186	Nil	108–202	—
Cheek setae	25–124	78–132	28–88	40–124	47–78	62–93	78–108
Antennal segments length (width)							
3	217–371	186–372	171–233	194–341	320–960	288–480	279–341
	(35–47)	(40–58)	(35–38)	(43–50)	(35–47)	(47–62)	(47–62)
4	202–318	186–326	140–202	171–310	158–268	256–416	202–248
	(31–35)	(38–47)	(38–40)	(43–50)	(31–47)	(55–62)	(55–62)
5	155–263	171–264	124–171	155–248	125–218	216–320	202–248
	(31–35)	(38–47)	(35–38)	(38–40)	(31–47)	(47–55)	(47–55)
6	108–155	108–171	93–116	101–155	99–140	155–217	155–186
	(23–25)	(28–31)	(28–30)	(28–31)	(31–39)	(31–35)	(47–49)
7	78–93	70–93	62–78	70–93	55–70	93–101	108–124
	(20–23)	(24–25)	(23–25)	(24–25)	(24–31)	(23–26)	(31–34)
8	62–78	62–78	55–62	62–86	78–82	78–93	78–93
	(15–16)	(16–18)	(15–16)	(15–18)	(16–18)	(16–19)	(15–18)
Longest seta on 3 (antennal segment)	68–155	63–223	48–75	88–202	34–260	60–70	78–108
,, on 4	75–140	63–194	53–63	50–163	62–140	60–70	78–108
Length of sense cones on 3	55–65	65–68	40–45	43–63	24–31	78–93	47–62
Length of mouth cone	171–233	208–248	171–217	171–264	186–264	233–264	248–295
Width at base (apex)	171–217	286–233	186–202	233–248	263–310	230–330	310–357
	(62–93)	(62–78)	(78–93)	(85–108)		(108–155)	(155–202)
Prothorax length	203–372	233–465	217–357	248–388	217–341	240–434	326–527
Width (anterior)	214–310	248–326	233–379	279–295	310–357	264–388	357–465
Width (posterior)	341–496	388–558	372–527	419–558	388–512	434–620	527–806
Anteroangulars	65–75	55–120	63–70	60–108	18–33	72–144	76–93
Midlaterals	80–85	78–130	75–90	100–113	47–78	78–108	141–124
Postangulars	63–75	100–113	88–103	88–125	47–78	93–108	186–233
Epimerals	113–135	113–188	80–120	125–163	100–113	88–176	202–233
Prothorax length	558–853	589–1007	496–775	651–961	217–341	240–434	791–930
Mesothorax, width	465–721	527–899	496–667	605–853	496–698	620–930	744–1100
Metathorax, width	465–713	504–899	481–713	605–853	496–698	620–930	729–1115
Forefemora length (width)	403–698	419–791	403–667	465–791	388–713	512–1280	481–806
	(108–326)	(124–310)	(124–310)	(124–310)	(140–279)	(144–224)	(171–419)
Foretarsal tooth length	25–124	33–108	25–70	55–116	70–155	–192	47–148
Forewings, length	1504–2279	1519–2557	1318–1442	1612–2434	1318–1860	2077–2945	2062–2634
Basal wing bristles	93–135	48–171	58–88	100–160	43–58	86–220	108–155
	85–124	83–132	63–75	88–125	43–70	86–242	155–202
	150–178	153–233	158–200	170–250	55–85	127–239	202–310
Double fringes	24–38	30–46	25–29	45–52	27–30	40–77	42–56
Abdomen width at base	434–574	450–682	481–651	574–698	512–677	496–698	651–960
at middle	327–481	341–434	388–527	403–589	357–574	403–620	574–868
across VII	210–295	217–327	233–310	295–310	264–326	264–388	526–403
across IX	171–233	171–279	170–233	148–264	186–233	202–326	248–310
Setae on IX B1	388–636	388–558	341–388	465–574	233–310	465–543	775–853
B2	496–690	419–605	310–341	419–589	233–341	465–543	775–853
B3	388–590	388–558	336–388	388–465	233–310	465–543	775–853
Tube, length	388–620	403–698	357–496	419–620	388–589	510–880	589–790
Width at base	93–108	93–155	93–124	140–155	93–124	140–171	155–202
at middle	78–108	78–108	62–108	93–108	70–93	108–140	108–155
at apex	47–78	62–78	47–70	78–82	55–62	78–93	78–93
Anal setae, length	124-540	295–512	248–310	311–512	233–310	465–543	465–512

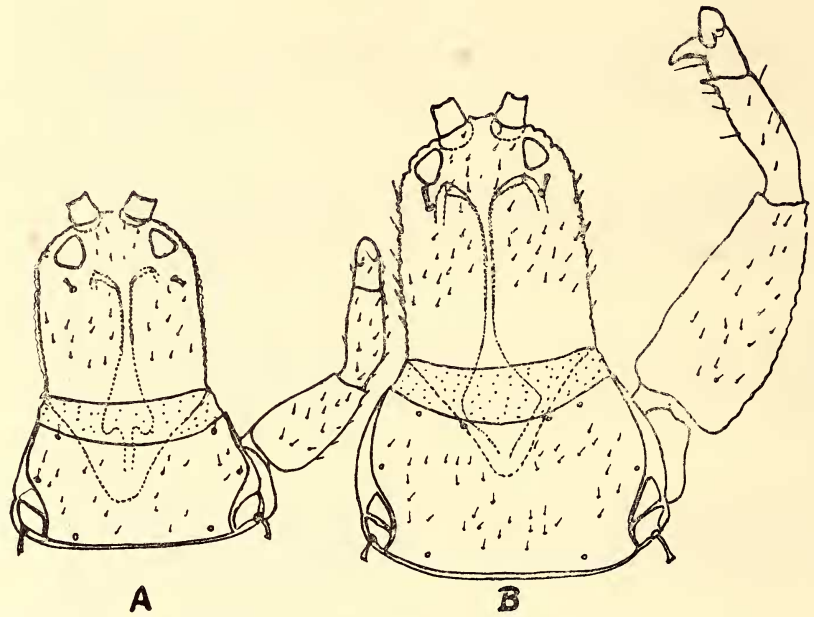
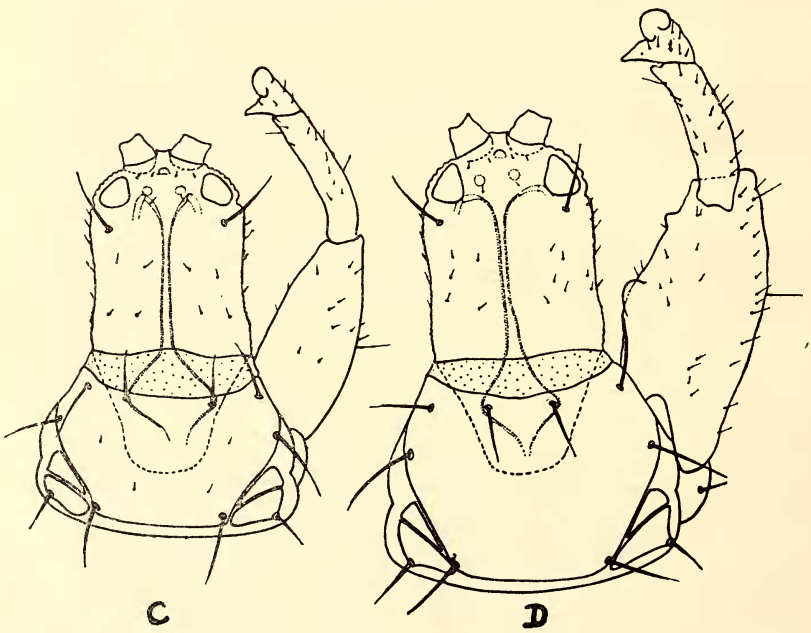


FIG. 5 *A*, *B*. Gynæcoid and œdymeicus male of *Stiepterothrips orientalis*.



C, *D*. Gynæcoid and œdymerous male of ***Polyphemothrips cracens.***

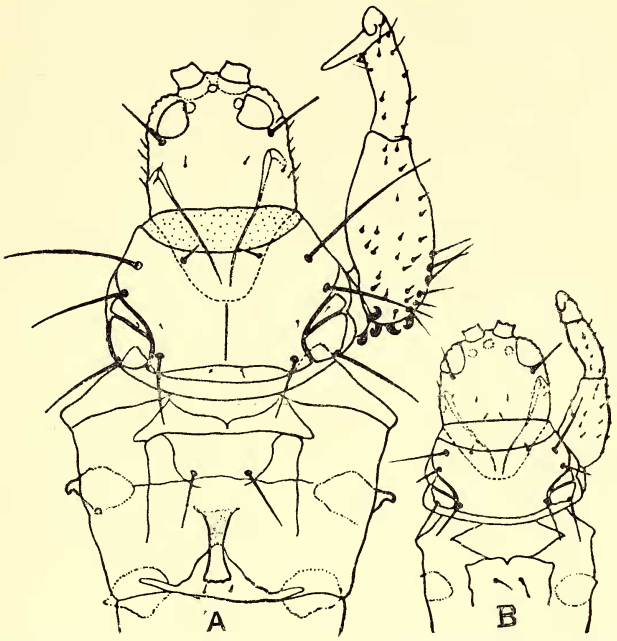
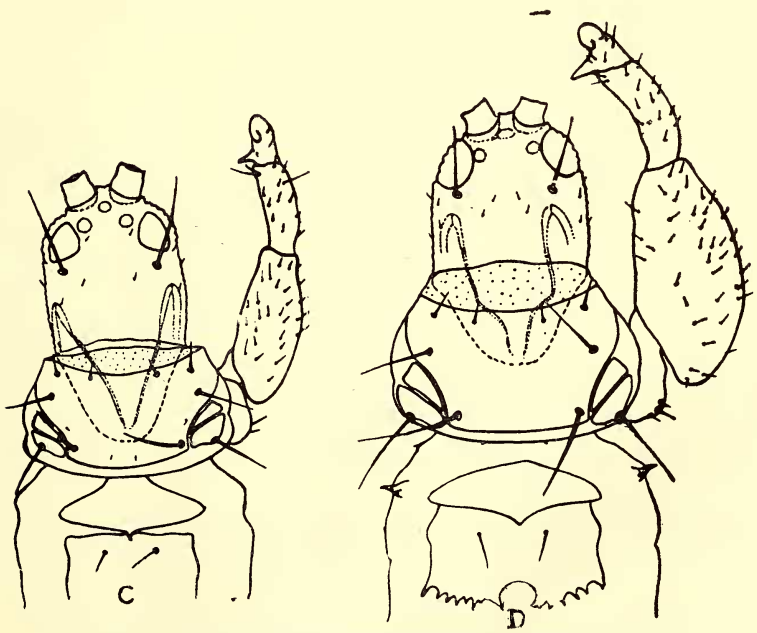


FIG. 6 *A*, *B*. Gynæcoid and œdymerous male of *Nesothrips falcatus*



C, *D*. Gynæcoid and œdymerous male of *Nesothrips acuticornis*.